

REMARKS/ARGUMENT

The Examiner objected to a typographical error in claim 1. The objection is requested to be held in abeyance until allowable subject matter is indicated.

Claims 1-11 were rejected as unpatentable over Birkelund et al. in view of the API Specification. The rejection is respectfully traversed.

The Office Action indicated that it would have been obvious to combine the two references for the purpose of increasing the resistance of the umbilical to crushing forces, i.e., lateral strength. However, this argument fails to consider the main problem solved by this patent, and the solution that was found by the present inventors. The problem is not lateral strength. Rather, the problem to be solved relates to increasing the tensile strength and/or the weight of the umbilical. The Examiner has given no reason why his proposed modification would have suggested itself for those purposes.

For umbilical steel tubes, generally the steel tubes themselves support the tension and so external armor layers are not needed. But in some special cases, some weight or ballast is needed in order to reduce the effect of dynamic strains on the umbilical. This additional weight raises the tension applied to the umbilical. The known solution to this problem of elevated tension is to add external armor layers, as suggested in the API specification (see API Specification, 17E, page 2, col. 1, paragraph 3.3). The main drawback of this solution, however, is that when armor layers are added, the external diameter of the umbilical is increased, which in turn increases the dynamic problems to be solved, as well as the cost of manufacturing.

Thus, in the API, when weight or tension problems are to be solved, the suggestion is to put on additional armor layers. Consistent with the API, in Birkelund (U.S. 5,362,921), the tension problem is solved by the armor layers (7, 8). The zinc wires (4, 5) are provided only to reduce corrosion, and have nothing to do with tensile strength, or any aspect of strength. The same corrosion problem is described in Antonsen (U.S. 6,012,495), in which aluminum or zinc tapes are used in a classic umbilical steel tube. As in Birkelund and the API, the tension is taken up in Antonsen by the steel tubes themselves. The last document cited, Ege (U.S. 4,427,033), does not teach anything about umbilicals. Moreover, Ege proposes to solve load and tension problems by putting armor layers (5, 6) all around the cable.

In conclusion, none of the documents cited, nor the API Specification 17E, suggests any way of solving tension and weight problems, other than by adding external armor layers. They do not suggest the use of at least one substantially solid steel rod, in combination with a plurality of steel tubes.

Independent claims 1 and 6 each recite including “at least one substantially solid steel rod” in an umbilical. The Examiner said it would have been obvious “to replace the zinc wires (4,5) of Birkelund et al. with at least one solid steel rod helically wound” This idea is invalid for several reasons.

First, the zinc wires in Birkelund et al. are conventional, light-duty wires which are provided for reducing corrosion. If someone had the idea of replacing them with steel, the replacement would be a similarly sized steel wire. It would provide no significant improvement in strength. The Examiner has given no justification of why skilled person would replace a zinc wire with a similar, steel wire. Therefore, there would have been no real motivation to make the Examiner’s proposed modification of the reference.

Further, the Examiner’s modification would deprive the known umbilical of the zinc wire, which it requires for corrosion resistance. The Examiner’s modification would increase the susceptibility to corrosion and make the umbilical useless.

The Examiner further stated, as a basis for his argument, that the “API teaches that filler material should be selected with consideration of the crushing forces” This comment does not support his conclusion that the zinc wires should be replaced by steel rods, since the zinc wires are not filler material.

Fourth, and most fundamentally, nothing in the prior art, Birkelund et al. and the API, discloses or suggests the use of a helically wound solid steel rod in an umbilical. Even if the art suggested that a filler should be chosen in consideration of radial crushing forces, nothing in the art would have suggested that said filler could or should be solid steel. Only steel tubes and other materials were known to the art. The Examiner’s conclusion that it would have been obvious to use a solid steel rod is based only on the present invention disclosure, not on the prior art.

Thus, the prior art does not suggest the invention recited in the independent claims.

Moreover, note that claims 3, 4, 8 and 9 recite a steel tube and/or steel rod in direct contact with a non-metallic outer sheath. Thus, the invention of these claims goes against the conventional teaching that armor layers should be provided between the non-metallic outer sheath and the inner tube and/or rod in order to increase the tensile strength and weight of the umbilical.

For at least the foregoing reasons, allowance of claims 1-11 is requested.

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